



Introduction

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Recognition of the relationship between the environment and mankind has assumed greater importance over the last two decades, even as research advances have emphasized the impact of the environment on human diseases. For example, only 15% of Parkinson's disease was found to be related to genetics and 85% to the environment (1). Another study found that only one third of cancers can be attributed to genetics (2).

Both developing and developed nations alike recognize the role of the environment in the health of their citizens. In China, environmental problems created by the country's extremely rapid economic resurgence are being addressed. China is increasing its awareness of the association between the environment and human health in many ways, including the publication of an official newspaper devoted entirely to the environment. The "China Environmental News" is published six days a week and has a circulation of 300,000 (3).

A program was launched in Europe in 1991—Environment for Europe—with the objective of improving the environment and human health in European countries. In a subsequent conference in 1993 (4), emphasis was on countries developing national environmental action plans. Hungary, in publishing its plan in 1997, recognized the complexities of this association by quoting the World Health Organization's definition of environmental health in their action plan:

Environmental health comprises those aspects of human health, including quality of life, that are determined by physical, biological, social, and psychosocial factors in the environment. It also deals with the theory and practice of assessing, correcting, controlling, and preventing those factors in the environment that can potentially affect adversely the health of the present and future generations. (5)

EHP publishes articles that address many of the issues included within the World Health Organization's broad definition of environmental health. For example, in October 2001, Wright and Steinbach published an article on the effect of violence on the development of asthma (6). Passchier-Vermeer and Passchier reviewed the effect of noise on public health in February 2001 (7). In the upcoming March issue, van Kempen et al. examine the effects of noise on blood pressure and ischemic heart disease (8).

EHP recognized the need to provide environmental health information to other nations in their native tongue and launched its Chinese language supplement and publication of a Spanish supplement is being considered. In 2001, two issues of the Chinese supplement (9,10) were published in collaboration with the Sun-Day Centre for Chinese Environ-Health, an organization of university scholars based in Nanjing, People's Republic of China. A quarterly Chinese language supplement is now available in print and can be accessed on our website (11).

In trying to provide information on issues in environmental health, our annual review supplement brings the latest findings in environmental health research into perspective for the specialists and opens new fields of discovery to scientists in various disciplines. The reviews summarize new developments in environmentally relevant areas, provide a perspective for these new findings, and provide sufficient background information for those not familiar with the specific topic. Selected topics for this supplement are proteomics, chemical toxicology, drinking water, air pollution, and environmental medicine.

Proteomics

Liebler, in his review article (12), defines proteomics as the study of proteomes, which are the collections of proteins expressed in cells. Whereas genomes are essentially invariant in different cells in an organism, proteomes vary from cell to cell, with time and as a function of environmental stimuli and stress. Liebler provides a timely review of the burgeoning field of proteomics, the current state of the art, and how the tools of proteomics can be used to address the issues related to the effects of environmental exposure. He focuses on analytical techniques as they apply to studies of how toxicants affect function through covalent modifications of proteins, namely, the environmental significance of protein modification. He also discusses problems associated with identifying protein targets of toxicants and reviews several methods that have previously been employed to answer these questions. He describes new approaches for the high throughput methods of proteomics and defines the limitations of these methods.

Chemical Toxicology

Clarkson (13) provides a thorough review of the toxicology and associated public health issues of mercury species most relevant to the general nonoccupationally exposed population worldwide. Clarkson's discussion of the three modern faces of mercury gives insight into the history of mercury distribution, environmental and biological metabolism, toxicology, and potential adverse health effects from exposure to mercury in its various forms. He focuses on the three faces of mercury in methylmercury, thimerosal, and mercury-vapor from amalgam fillings. This timely article contains information of environmental significance, with the author drawing provocative conclusions about the potential benefits of mercury-containing products.

In 1998, *EHP* published a monograph consisting of 25 papers on chemical mixtures (14). Given the horrific events of 11 September 2001 and the subsequent exposure to first responders and others to the range of combustion by-products produced in this disaster, it is timely that we once again return to the issue of toxicity of chemical mixtures. This year we provide perspective on understanding the health effects of chemical mixtures (15). The authors present an in-depth discussion of key chemicals of concern with respect to environmental exposures, particularly as they relate to insights about mechanism of action. Their main objectives are to show basic principles needed to study adverse health effects of chemical mixtures from a human disease perspective and the contributions of data developed using *in vitro* and *in vivo* toxicity studies.

Drinking Water

The availability of safe drinking water throughout the United States is a major accomplishment of the twentieth century. Levin et al. (16) discuss the public water infrastructure, global climate effects, water-borne disease, land use, groundwater, surface water, and United States regulatory history. The article provides an important discussion of the difficult challenges that water utilities and consumers will face over the next several decades.

The use of disinfecting agents such as chlorine, chloramine, ozone, and chlorine dioxide was one factor making it possible for

the United States to achieve this broad level of availability of safe drinking water. However, disinfection by-products are formed when disinfectants react with organic and inorganic compounds in water. Epidemiology studies have linked disinfection by-products to various cancers and adverse pregnancy outcomes. Exposure assessment to disinfection by-products has been a major shortcoming of epidemiologic studies. Arbuckle et al. (17) attempts to fill in this gap by providing a comprehensive overview of a workshop on epidemiology literature concerning exposure to disinfection by-products.

Continuing on the topic of disinfection by-products, Woo et al. (18) reviews mechanism-based structure-activity relationships (SAR) analysis used in ranking the carcinogenic potential of drinking water disinfection by-products. The authors review over 200 disinfection by-products found in drinking water and provide a prioritization method to rank the carcinogenic potential of individual disinfection by-products.

In a more focused article, Bove et al. (19) review the association between drinking water chlorination disinfection by-products and adverse pregnancy outcomes, noting the inherent difficulties in exposure assessment given the limited monitoring data. The authors concluded that “small for gestational age,” neural tube defects, and spontaneous abortions are moderately associated with trihalomethanes.

Air Pollution

Increased morbidity and mortality with the elevation of ambient particulate matter has been demonstrated in epidemiologic studies. Fugitive fly ash from the combustion of oil and residual fuel oil significantly contributes to the ambient air particle burden. The inorganic residue that remains after burning carbonaceous materials is termed “fly ash.” Ghio et al. (20) review the biologic effects of oil fly ash at a time when the use of residual-oil fly ash (ROFA) as a surrogate for ambient air particulate matter is strongly debated. The authors provide a detailed description of the putative mechanism by which inhaled ROFA induces lung injury.

In another attempt to develop a composite index to reflect the aggregate burden of long-term exposure to criteria air pollutants in the United States (particulate matter, ground level ozone, sulfur dioxide, lead, nitrogen dioxide, and carbon monoxide), Kyle et al. (21) consider evidence for long-term adverse health effects from criteria pollutants. Although emphasis has been placed on short-term exposures, research shows that long-term exposure to lower concentrations of air pollutants can also result in adverse health effects. The authors review the exist-

ing measures used for policymaking purposes, discuss the limitations of such measures given the evidence reviewed, and then propose an approach that also would be informative and useful in considering policy for air pollutants.

The growing problem of asthma is addressed by Pandya et al. (22). They summarize how diesel particles might be involved in asthmatic reactions in people. As a composite of vapors, gases, and fine particles emitted by diesel-fueled compression ignition engines, high concentrations of diesel exhaust may act as nonspecific airway irritants. At lower concentrations, there is a promotion of the release of specific cytokines, chemokines, immunoglobulins, and oxidants in the upper and lower airway. The authors conclude that the release can culminate in airway inflammation, mucus secretion, serum leakage into the airways, and bronchial smooth muscle contraction.

Environmental Medicine

The field of environmental medicine is covered frequently in *EHP* through publication of research articles and reviews and by publication of case presentations in our “Grand Rounds in Environmental Medicine” series. The course of the development of this area of medicine in Germany is discussed by Seidel (23) who sees the initial development of environmental medicine as a disappearing discipline in Germany and that now may possibly split into two general areas. One area would address the preservation of living conditions for mankind on this planet and the other would deal with individual patient care such as controversial syndromes, risk perception, etc.

One area of environmental medicine receiving much attention is breast cancer. A recent epidemiologic analysis concluded that 73% of breast cancers are attributable to environmental (including lifestyle) factors (2). DeBruin and Josephy (24) examine the chemical etiology of breast cancer from an environmental perspective. Brief overview sections are devoted to the role that susceptibility factors (*BRCA1*), tumor suppressor genes (*p53*), diet, alcohol consumption, smoking, polymorphisms in P450 enzymes, occupational exposures to chemicals, dietary aromatic amines and heterocyclic amines from dietary sources, and organochlorines, may play in breast cancer risk.

As further research identifies even more clearly the role of the environment in human health, *EHP* will continue to provide reliable information through its coverage of scientific news and publication of original research and review articles, such as those in this year's review issue. Progress in this area can only be achieved when we recognize the importance of the environment on our well-being.

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